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Strengthening Ethics Education for Construction Engineering and Management Students

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BACKGROUND

The construction industry stands a cornerstone of the U.S. economy, employing millions and shaping the built environment [1]. Its significance extends beyond economic impact, influencing communities and ecosystems [2]. This dynamic sector has witnessed a diversification of operations, encompassing design, renovation, maintenance, supply chain management, and demolition. This expansion has led to increasingly complex projects, demanding sophisticated technical and managerial skills [3].

Within this multifaceted landscape, ethical considerations have become paramount. Construction projects inherently involve numerous stakeholders, including local communities, governments, and the environment [4]. Decisions made throughout the project lifecycle have far-reaching consequences for all involved. Furthermore, the collaborative nature of the industry, with architects, engineers, contractors, and regulatory bodies all playing crucial roles, amplifies the complexity of maintaining integrity and compliance [5].

Recent incidents underscore the critical need for robust ethics education within the construction industry. For example, the 2024 allegations against Valor Security and Investigations, involving falsified safety certifications, highlighted the severe consequences of ethical lapses, jeopardizing worker safety and violating industry regulations [6]. Instances of fraudulent practices, such as dishonest expenses claims and misuse of client funds, further erode trust and integrity within the construction sector [7].

Globalization and growing environmental concerns have introduced new ethical dilemmas. Construction professionals are increasingly tasked with balancing economic, social, and environmental priorities [8]. This necessitates a nuanced understanding of ethical considerations and the ability to navigate complex challenges.

This paper focuses on the role of ethics education in Construction Engineering and Management (CEM) programs. It aims to bridge the gap between academic preparation and the ethical challenges encountered in professional practice. By understanding the perspectives of industry professionals, this research will identify the gap between current ethics training in CEM programs and the ethical expectations of the industry. Based on these findings, the study will propose actionable strategies for improvement in ethics education. Through enhanced ethics education, we aim to develop graduates who are not only technically skilled but also ethically responsible leaders in the construction industry.

ETHICAL CHALLENGES AND EDUCATIONAL PRIORITIES IN CONSTRUCTION

The construction industry faces a unique set of ethical challenges stemming from its complexity, diverse stakeholders, and high-stakes environment. Corruption, bribery, safety violations,

environmental harm, and conflicts of interest are common concerns. Previous studies have highlighted unethical practices like bid-rigging and cost manipulation, often driven by intense competition and profit pressures [9]. The fragmented nature of the industry, involving multiple contractors, subcontractors, and regulatory bodies, further complicates the enforcement of ethical standards [10]. Globalization adds another layer of complexity, introducing diverse cultural norms and legal environments [11]. A unified framework of ethical guidelines tailored to the specific demands of the construction industry is urgently needed.

Insights from ethics education in other fields, such as medicine, engineering, and business, offer valuable guidance. Medical ethics curricula often employ case-based learning and simulations to prepare students for real-world dilemmas [12]. Engineering ethics education emphasizes interdisciplinary collaboration and global perspectives to address complex technological and infrastructural challenges [13]. Business schools prioritize decision-making frameworks that balance profit with corporate social responsibility [14]. These approaches emphasize the importance of contextual, experiential, and interdisciplinary learning in fostering ethical awareness and decision-making skills.

Despite the acknowledged importance of ethics, significant gaps persist in construction education. Wang and Buckeridge [15] found that many programs lack a dedicated ethics curriculum, often addressing ethical considerations superficially within broader management courses. Students frequently encounter a disconnect between theoretical ethical frameworks and the complex, situational dilemmas they face during internships or early careers [16]. The lack of emphasis on global and sustainability issues in ethics education further exacerbates this gap, leaving graduates ill-prepared for the challenges of an increasingly interconnected and environmentally conscious world [15]. Addressing these gaps requires a paradigm shift in construction education.

ETHICS ACCREDITATION STANDARDS IN CONSTRUCTION EDUCATION

Most CEM programs in the United States are accredited by either the American Council for Construction Education (ACCE) or the Accreditation Board for Engineering and Technology (ABET). Both accrediting bodies prioritize ethics education within their accreditation standards, establishing these standards as critical benchmarks for the quality and effectiveness of CEM programs. By explicitly requiring ethics education, ACCE and ABET underscore its paramount importance in preparing graduates for the complex ethical challenges they will encounter in their professional careers. Analyzing how these standards address ethical considerations provides valuable insights into the current landscape of ethics education within the field.

ACCE mandates that accredited programs prepare students for the knowledge and skills to understand and address ethical issues within the industry. This includes incorporating ethics education into the curriculum through dedicated courses or integrating it into broader subjects like construction law and professional practice.

ACCE specifically requires that all graduates demonstrate an understanding of professional and ethical responsibility, emphasizing integrity in decision-making and adherence to industry

standards [17]. The accreditation body states, “Upon graduation from an accredited Bachelor’s Degree Program, ACCE requires that all graduates shall be able to analyze professional decisions based on ethical principles” [17].

Furthermore, ACCE encourages experiential learning, emphasizing the importance of real-world scenarios and case studies to bridge the gap between theoretical knowledge and practical application. The ACCE accredited programs are encouraged to engage industry professionals through guest lectures or panel discussions to provide diverse perspectives on ethical challenges.

ABET also prioritizes ethics education, particularly within its accreditation criteria for engineering and technology programs. ABET’s General Criterion 3 explicitly identifies ethics and professional responsibilities as a key student outcome. This criterion requires students to recognize ethical and professional responsibilities in engineering contexts and make informed judgments, considering the impact of engineering solutions on global, economic, environmental, and societal contexts [18].

ABET accreditation standards emphasize interdisciplinary approaches to ethics education, encouraging programs to integrate ethical considerations across multiple courses. The ABET accredited programs are expected to expose students to complex ethical dilemmas through case studies, team projects, and discussions that simulate real-world scenarios.

Both ACCE and ABET recognize the critical importance of ethics education in preparing students for professional practice. While ACCE focuses on construction-specific ethical challenges, such as contract compliance and safety standards, ABET’s approach is broader, encompassing global and interdisciplinary dimensions. Both accreditation bodies stress the importance of experiential and applied learning methods, ensuring that students are equipped to navigate the ethical complexities of their respective fields. These requirements emphasize the need for robust and comprehensive ethics education programs that align with the unique demands of CEM disciplines.

INTEGRATING ETHICAL THEORIES WITH PRACTICAL ISSUES

To provide a comprehensive ethics education, it is crucial to bridge the gap between classical ethical theories and the practical issues faced in the construction industry. Ethical theories such as utilitarianism, deontology, virtue ethics, and justice theory offer valuable frameworks for evaluating complex dilemmas and guiding ethical decision-making. By incorporating these theories into construction education, students gain a deeper understanding of how abstract concepts translate into real-world practices, enabling them to approach ethical challenges with a more structured and principled mindset.

Utilitarianism emphasizes making decisions that maximize overall well-being or minimize harm [19]. This approach can be applied to situations such as balancing cost efficiency with worker safety or environmental stewardship. Students can analyze real-world case studies where utilitarian principles are used to assess the long-term consequences of decisions, such as

choosing environmentally sustainable construction materials despite higher initial costs because of the broader environmental benefits.

Deontological ethics, rooted in duty and adherence to moral rules, can guide professionals in maintaining integrity and upholding safety standards even when financial pressures encourage cutting corners [19]. Scenarios involving safety violations or conflicts of interest can serve as teaching tools, allowing students to practice identifying their moral obligations and understanding the long-term importance of following ethical standards regardless of external pressures.

Virtue ethics, which focuses on character and moral virtues such as honesty, fairness, and courage, is highly relevant in developing professionals with strong ethical judgment [20]. Discussions can emphasize how fostering virtues like transparency and fairness can enhance trust among stakeholders, improving collaboration and long-term project success.

Incorporating these theories into practical exercises such as role-playing, simulations, and case studies provides students with hands-on experience in applying ethical principles. For example, students might be presented with a case in which they must weigh competing ethical priorities, such as ensuring compliance with environmental regulations while meeting tight project deadlines. Guided reflections and discussions can help students explore how different ethical theories offer alternative approaches to resolving these dilemmas.

Furthermore, integrating ethical frameworks with industry-specific codes of ethics creates a more robust ethical foundation. This connection ensures that students not only understand ethical theories in isolation but also see how these principles reinforce professional standards and industry expectations.

By combining classical ethical theories with real-world construction issues, CEM programs can equip students with the critical thinking and decision-making skills necessary to navigate complex ethical situations.

INDUSTRY-SPECIFIC CODES OF ETHICS

The ASCE (American Society of Civil Engineers) Code of Ethics [21], the AIC (American Institute of Constructors) Code of Ethics for Constructors [22], and the CMAA (Construction Management Association of America) Code of Professional Conduct [23] all provide ethical frameworks for their respective professions. While exhibiting overlapping priorities, each code emphasizes unique aspects tailored to its specific domain. A comparative analysis reveals several key insights as shown in Table 1.

These comparative insights highlight the need for an integrated approach to ethics education within CEM curricula. By synthesizing the shared principles and unique features of these codes, CEM programs can equip students with a comprehensive understanding of professional ethics. Emphasizing both universal values, such as integrity and public welfare, and emerging priorities, such as sustainability and diversity, prepares graduates to navigate the multifaceted ethical challenges they will encounter in their careers. This approach ensures alignment with industry

expectations while fostering a culture of ethical excellence across the construction and engineering professions.

Table 1. Comparative Analysis of Industry-Specific Codes of Ethics

Shared Core Principles	Public Safety and Welfare	All three codes emphasize the paramount importance of protecting public health, safety, and welfare. For instance, the ASCE Code explicitly mandates engineers to prioritize these concerns, while the AIC and CMAA Codes highlight similar commitments within their specific contexts of construction and project management.
	Integrity and Honesty	Integrity is a foundational value across the three codes. The CMAA calls for the highest standards of honesty and integrity, and the AIC prohibits deceptive practices. Similarly, the ASCE emphasizes truthful representation of professional opinions and qualifications.
	Competence and Professional Excellence	All three codes stress that professionals should work within their areas of competence and continuously seek to enhance their knowledge and skills. The CMAA explicitly advocates for professional development and best practices, aligning with the ASCE's call for ongoing education and the AIC's emphasis on staying informed about advancements in construction.
Differentiating Priorities	Diversity and Inclusion	The CMAA uniquely emphasizes creating a diverse and inclusive workforce, explicitly addressing discrimination and harassment. While the ASCE touches on respecting diverse community needs, the CMAA provides a more detailed framework for promoting equity in professional practice.
	Sustainability	The ASCE Code dedicates significant attention to sustainable development, urging engineers to balance societal, environmental, and economic impacts. The CMAA echoes this focus but frames it within the project lifecycle's sustainability and resiliency goals. The AIC Code, while indirectly supportive, does not explicitly address sustainability as a standalone principle.
	Client-Centered Practices	The AIC and CMAA codes provide more detailed guidance on client relationships. For example, the AIC emphasizes fair and unbiased advice to clients, while the CMAA stresses ethical representation of client interests. The ASCE, in contrast, integrates these responsibilities into broader societal and professional obligations.
Unique Features	Reporting Misconduct	The ASCE Code explicitly encourages engineers to report ethical violations, reflecting a proactive approach to upholding ethical standards. While the CMAA and AIC Codes emphasize integrity, they do not provide as direct a mandate for reporting misconduct.
	Workplace Behavior	The CMAA's zero-tolerance policy for harassment and its focus on fostering respectful, collaborative environments stand out as a significant addition to ethical practices in construction management.

INDUSTRY PERSPECTIVES: SURVEY ON ETHICS EDUCATION

To investigate the perspectives of industry professionals on ethics education, a mixed-methods survey instrument was designed. Quantitative questions included Likert-scale items assessing

participants' perceptions, attitudes, and agreement levels, alongside dichotomous (yes/no) items to gather demographic information. Qualitative questions invited open-ended responses to allow for in-depth exploration of perspectives, experiences, and suggestions for improvement.

A pilot survey was conducted with nine individuals to assess the clarity and effectiveness of the survey instrument. Based on the pilot results, the survey instrument was refined. The final survey was then administered electronically to a sample of 68 construction professionals from 28 different companies. This diverse sample included individuals with a range of experience levels, with 23.5% having over 20 years in the industry. Project Managers (30.9%, N=21) and Superintendents (25%, N=17) were the most frequently represented occupational groups. Figure 1 presents the demographic profile of industry professional participants.

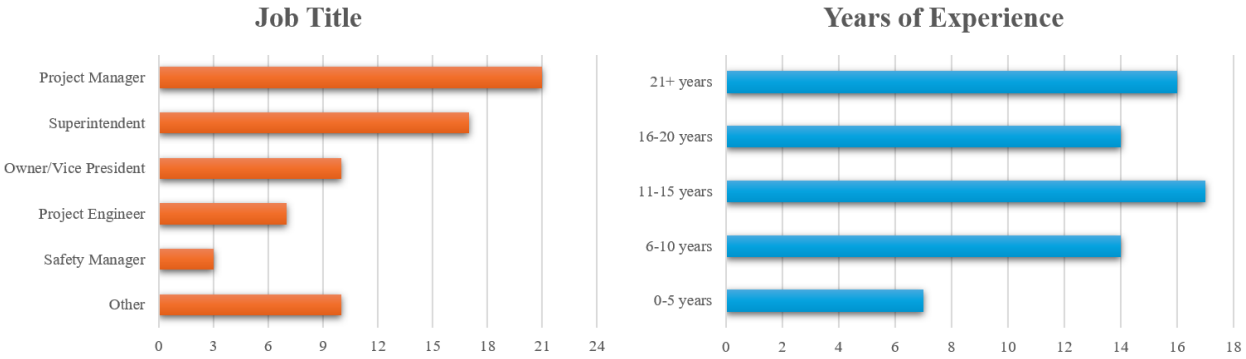

Figure 1. Participant Demographics

The quantitative data were analyzed using descriptive statistics while qualitative data were coded thematically.

100% of the respondents rated the importance of ethical conduct for construction professionals as "Very Important" (85.3%, N=58) or "Important" (14.7%, N=10). This finding underscores the critical role of ethical conduct in the successful and sustainable practice of construction.

Through an open-ended question of "What are the most critical ethical challenges you encounter in your professional practice?", several key ethical challenges were identified.

- Bribery and Corruption (7.4%, N=5): Concerns included bribery in procurement processes and subcontracting.
- Safety Violations (10.3%, N=7): Issues such as falsifying safety records, overlooking safety violations, and prioritizing profit over worker well-being were cited.
- Environmental Violations (19.1%, N=13): Illegal dumping, inadequate waste disposal, and disregard for environmental regulations were major concerns.
- Conflicts of Interest (13.2%, N=9): Respondents expressed concerns about potential conflicts of interest arising from personal relationships, financial incentives, and competing priorities.

Even though results may not be fully generalized due to a small sample size (N=68), these findings provide valuable insights into the real-world ethical dilemmas faced by construction professionals.

Furthermore, most respondents emphasized the need for graduates to possess key practical skills. These include:

- Ethical Decision-Making (20.6%, N=14): This encompasses critical thinking, problem-solving, and the ability to apply ethical frameworks to real-world situations.
- Communication and Interpersonal Skills (26.5%, N=18): Effective communication and interpersonal skills are crucial for building trust, resolving conflicts, and maintaining ethical relationships with clients, colleagues, and subcontractors.
- Professionalism and Integrity (33.8%, N=23): Industry professionals stressed the importance of professionalism, integrity, and a strong commitment to ethical conduct in all aspects of their work. This includes adhering to professional codes of ethics, maintaining confidentiality, and acting with honesty and transparency.

These findings underscore the need for CEM programs to move beyond theoretical instruction and provide graduates with the practical skills and competencies necessary to navigate the ethical complexities of the construction industry.

The final survey question asked industry professionals, "Would you be willing to participate in guest lectures or mentorship programs to provide students with real-world insights into ethical decision-making in construction?" A significant proportion of respondents (78%, N=53) expressed a willingness to contribute to student learning. This indicates a strong desire among industry professionals to engage with academia and support the development of future generations of ethical construction professionals. This willingness to collaborate presents a valuable opportunity to bridge the gap between academia and industry, providing students with valuable real-world perspectives and insights.

There is a possibility of response bias, as participants may provide socially desirable answers. Despite this, the results from the industry professional survey clearly highlight the critical importance of ethics in the construction industry. Industry professionals strongly support the need for robust ethics education in CEM programs and are eager to collaborate with academia to enhance student learning and development. The findings highlight the need for graduates to possess not only technical skills but also strong ethical judgment, critical thinking abilities, and the ability to navigate complex ethical dilemmas in a professional and responsible manner.

PROPOSED STRATEGIES TO STRENGTHENING ETHICS EDUCATION IN CEM PROGRAMS

To address the ethical challenges identified in the construction industry and the gaps in current CEM curricula, targeted enhancements are necessary. These improvements aim to ensure that graduates possess both the technical expertise and ethical judgment necessary to navigate the complexities of the industry. The actionable strategies proposed in Tabe 2 can enhance ethics education in CEM programs.

As a practical implementation of the proposed strategies, a capstone course could have students analyze real-world ethical dilemmas and present their recommendations to a panel of industry professionals. Additionally, a CEM program could host an annual ethics workshop featuring

industry professionals, providing students with the opportunity to practice ethical decision-making in realistic scenarios.

Table 2. Proposed Strategies for Improvement in Ethics Education

Integration of Ethics as a Core Component	Ethics education should be seamlessly integrated throughout the CEM curriculum, rather than treated as an isolated module. This integration can be achieved by embedding ethical discussions with core courses such as project planning, cost estimating, safety, and project management. Additionally, a dedicated course on construction ethics should be included to provide a strong foundation in ethical theories and their application.
Use of Case Studies and Real-World Scenarios	Case-based learning is crucial. Case studies should cover diverse topics such as bribery and corruption in procurement, safety violations, environmental challenges, and conflicts of interest. Simulations and role-playing activities can provide valuable hands-on experience in ethical decision-making under realistic conditions.
Collaboration with Industry Professionals	Engaging industry professionals is crucial for enriching the learning experience. This can be achieved through guest lectures, mentorship programs, and panel discussions that provide students with real-world perspectives and insights into ethical challenges.
Focus on Emerging Ethical Priorities	Ethics education must evolve to address emerging challenges, such as globalization, sustainability, and diversity. Curriculum should include training on cultural competence, environmental stewardship, and the promotion of diversity, equity, and inclusion within the construction industry.
Experiential Learning Opportunities	Internships, co-op programs, and service-learning projects allow students to confront ethical dilemmas in real-world settings. Institutions should partner with construction firms to offer internships emphasizing ethical training. Community-based projects can provide opportunities to apply ethical principles to address societal challenges.
Assessment and Continuous Improvement	Robust assessment methods are crucial to evaluate the effectiveness of ethics education. This includes evaluating students' ethical decision-making skills through case study analyses and practical assignments. Conducting surveys of alumni and industry stakeholders will provide valuable feedback on the relevance and impact of ethics training. In addition, regular review and updating of the curriculum are essential to reflect industry changes and emerging trends.

By implementing these enhancements, CEM programs can better prepare students to address ethical complexities with integrity and professionalism. Strengthened ethics education will contribute significantly to the long-term sustainability, public trust, and positive societal impact of the construction industry.

MEASURING THE LONG-TERM IMPACT OF ETHICS EDUCATION

Assessing the long-term impact of ethics education in CEM programs is crucial to ensure that students develop ethical competencies that endure beyond graduation. Unlike short-term assessments focused on classroom performance or immediate knowledge retention, measuring long-term impact requires a comprehensive approach that examines how ethical principles are applied in professional practice over time. This involves tracking graduates' behavior, decision-making, and professional development across various stages of their careers.

One of the most effective ways to measure long-term impact is through periodic alumni surveys and follow-up assessments. These tools can gather self-reported data on how graduates perceive the relevance and effectiveness of their ethics education in real-world situations. Surveys can explore areas such as ethical decision-making, conflict resolution, and adherence to professional standards, while also identifying challenges that graduates have faced in applying ethical principles.

Feedback from employers offers another valuable perspective on the long-term effectiveness of ethics education. Structured interviews or surveys with employers can help assess how well graduates demonstrate ethical behavior in professional contexts. Incorporating a 360-degree assessment system can offer a comprehensive view of a graduate's ethical performance and integrity in the workplace [24].

Tracking individual graduates through longitudinal case studies can offer rich, qualitative insights into the practical application of ethical concepts. These case studies can follow selected graduates through significant career milestones and ethical dilemmas they have encountered, documenting how their education shaped their responses. Narrative reflections from alumni can also provide in-depth, personal accounts of how ethical challenges were addressed, offering qualitative evidence of the long-term impact of CEM ethics training.

Measuring the long-term impact of ethics education poses several challenges. Alumni surveys are prone to self-reporting bias, comprehensive employer feedback can be difficult to obtain, and the ever-evolving nature of ethical issues in the industry further complicates assessment. To overcome these obstacles, close collaboration with industry partners is required to monitor graduates' ethical performance and assess the effectiveness of ethics education. Additionally, regular review and refinement of assessment frameworks are vital to ensure alignment with industry developments and evolving ethical standards.

By adopting a multi-faceted assessment strategy, CEM programs can gain a more accurate and comprehensive understanding of how ethics education shapes professional behavior over time.

DISCUSSIONS

To better align with the standards of ACCE and ABET, ethics education in CEM programs should adopt a more structured and integrative approach. Ethics should not be confined to a single course but instead embedded across the curriculum. By integrating ethics into core courses such as project management, construction safety, estimating, and scheduling, students can see its relevance in real-world applications and develop a deeper understanding of how ethical dilemmas arise in different aspects of construction. This approach ensures that students receive continuous exposure to ethical principles throughout their education, allowing for incremental skill-building and reinforcement.

Interdisciplinary collaboration is another crucial component. Partnering with related disciplines such as engineering, business, and environmental science can provide broader perspectives on ethical challenges, particularly in areas like sustainability, cultural competence, and global business practices. For instance, joint courses or seminars involving faculty from multiple fields

can give students practical insights into how ethical frameworks apply across different contexts. This collaborative effort mirrors the interdisciplinary nature of construction projects and prepares students for the complexity of industry ethics.

Faculty training is essential to ensure that instructors are equipped to teach ethics effectively. Providing professional development opportunities focused on ethics education can greatly improve the delivery of ethics content. Additionally, industry professionals can play a pivotal role in this effort, serving as guest lecturers and mentors to provide real-world examples and enrich the learning experience.

Assessment and continuous improvement are vital for maintaining high standards in ethics education. CEM programs should develop clear assessment plans aligned with ACCE and ABET outcomes. These plans can include evaluating students' ethical decision-making skills through case analyses, role-playing exercises, and capstone projects. Regular feedback from alumni and industry stakeholders can help assess the relevance and impact of the ethics curriculum. Periodic program reviews will ensure that ethics education remains up to date with evolving industry trends and emerging ethical challenges, such as those related to technology, globalization, and diversity.

By implementing these strategies, CEM programs can produce graduates who are not only technically competent but also equipped with the ethical judgment necessary to make responsible decisions in a complex industry landscape. These improvements will ultimately strengthen the construction industry's commitment to integrity, sustainability, and public trust.

CHALLENGES AND FUTURE DIRECTIONS

While significant progress can be made in integrating ethics education into CEM programs, several challenges remain. These include limited faculty expertise in ethics, competing demands within existing curricula, and insufficient opportunities for experiential learning. Moreover, the construction industry is constantly evolving, with rapid technological advancements, globalization, and increasing environmental pressures. This necessitates continuous adaptation and refinement of ethics curricula to remain relevant.

Future directions for ethics education in CEM programs should prioritize:

- Integrating ethics across disciplines, such as engineering, law, business, and environmental science.
- Utilizing interactive learning technologies to enhance the delivery and effectiveness of ethics education.
- Strengthening collaborations with industry professionals through guest lectures, mentorship programs, and real-world projects.
- Investigating the long-term impact of ethics education on professional practice to refine curricula and identify areas for improvement.

By addressing these challenges and pursuing innovative solutions, CEM programs can ensure that ethics education remains a cornerstone of professional preparation. This approach will equip

graduates with the ethical judgment and decision-making skills necessary to navigate the complexities of the construction industry with integrity and professionalism.

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